Visualizing Risk by Example: Demonstrating Threats Arising From Android Apps

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Introduction

- 67 million apps are downloaded daily from PlayStore

- Felt et al.: only 17% of Android users understand permissions → huge risk for security of personal data
Motivation

• Wall of text
Motivation

• Problems: misunderstanding and habituation
• Users ignore security advices → security risk!
• Kelley et al.: Permissions as a part of the decision-making process
• Rader et al.: users learn better about security from personal stories
• Our approach: visualize threats by example
Mockup of the Market

• Option to switch between visualization and normal version

• Four categories
  • Office (reasonable permissions)
  • Finance (slightly unreasonable permissions)
  • Weather (obviously unreasonable permissions)
  • Games (no permissions)

• Each contained four apps
Visualization

The app prevents the display from sleeping. This drains the battery.

This app could download files like virus.apk.

The app can determine your location. (currently: N 52.379774 - E 9.723871)

I understand what permissions the app demands.

Accept to continue.
Study Structure

• Two questionnaires
• Practical part
  • Within-subject
  • Together with the participant, we installed our mockup market on his personal device
  • Each participant was asked to install an app out of every category
• At the end, we debriefed the participants
Results in Numbers

• 11 Participants, 2 women and 9 men
• Before: 36.4% of participants worry about security
  Afterwards: 65.3% will be more mindful in future
• Number of installed apps: textual 2.9, visual 1.7
  (significant - paired-samples t-test)
• High requesting app installations decreased from 50% to 13.6%
Results in Words

• “Omg, it can see my photos? I don't want that! This scares me a bit...”

• “Now I understand what this „phone status“ permission means. I did not get that before. Prospectively I'll be more careful!”

• “The new system is a lot better. I'd prefer to use it in future because it helps me to understand whether a permission might be necessary or not.”
Conclusion

- Promising results
- Concrete examples: more effective way of warning users
- More intuitive, easy to understand for non-IT-experts
- Can lead to increased awareness of private data and the risk of disclosing it unintentionally
Future Work

• Validate results in a larger study

• Further problems:
  • How to display & explain permissions which cannot be visualized that easy?

• Retrospective use: warn user afterwards

• Use this strategy in other scenarios where comprehension is a problem
Thank you for your attention

Questions?